

Steam Turbines

CHAPTER I

Introduction

The development of the modern steam-turbine industry dates from the almost simultaneous inventions of the Hon. Sir Charles Algernon Parsons and the late Dr. Carl Gustav Patrick de Laval in the early eighties of last century. The progress of this industry both as regards design and application was comparatively slow up to the beginning of the present century, but since then it has made extraordinarily rapid strides, with the result that to-day the steam turbine ranks as the foremost prime mover for all large power units.

The conversion of heat energy into mechanical energy is effected in a steam turbine by utilizing the kinetic energy acquired by steam in expanding from a higher to a lower pressure.

The problem confronting the designer is to ensure that the desired expansion approaches the adiabatic line as closely as possible, and that the kinetic energy attained is converted into mechanical energy in the most efficient manner.

The external losses, namely those due to bearing friction, &c., and to radiation, are relatively small and unimportant in a steam turbine. The conditions of efficient expansion are so well understood to-day that the losses in this direction are also generally reduced to a minimum, but there is still a margin for improvement in the methods of utilizing the kinetic energy, and it is particularly due to variations in this direction that individual turbines differ in regard to their over-all efficiency.

Types.—Broadly speaking, turbines are divided into two main types, namely, the impulse and reaction types.

Impulse Turbines.—Where the expansion takes place in fixed blades or nozzles, and the energy is transferred to revolving blades without further pressure drop, the turbine is known as an impulse turbine. In the De Laval turbine, which was the first practical impulse turbine, the steam was expanded over its full range of pressure in a single *nozzle* or batch of

nozzles, and the
energy was utilized in a single row of blades mounted on a
wheel or disc.